Modeling the air quality impacts and health benefits of emissions reductions

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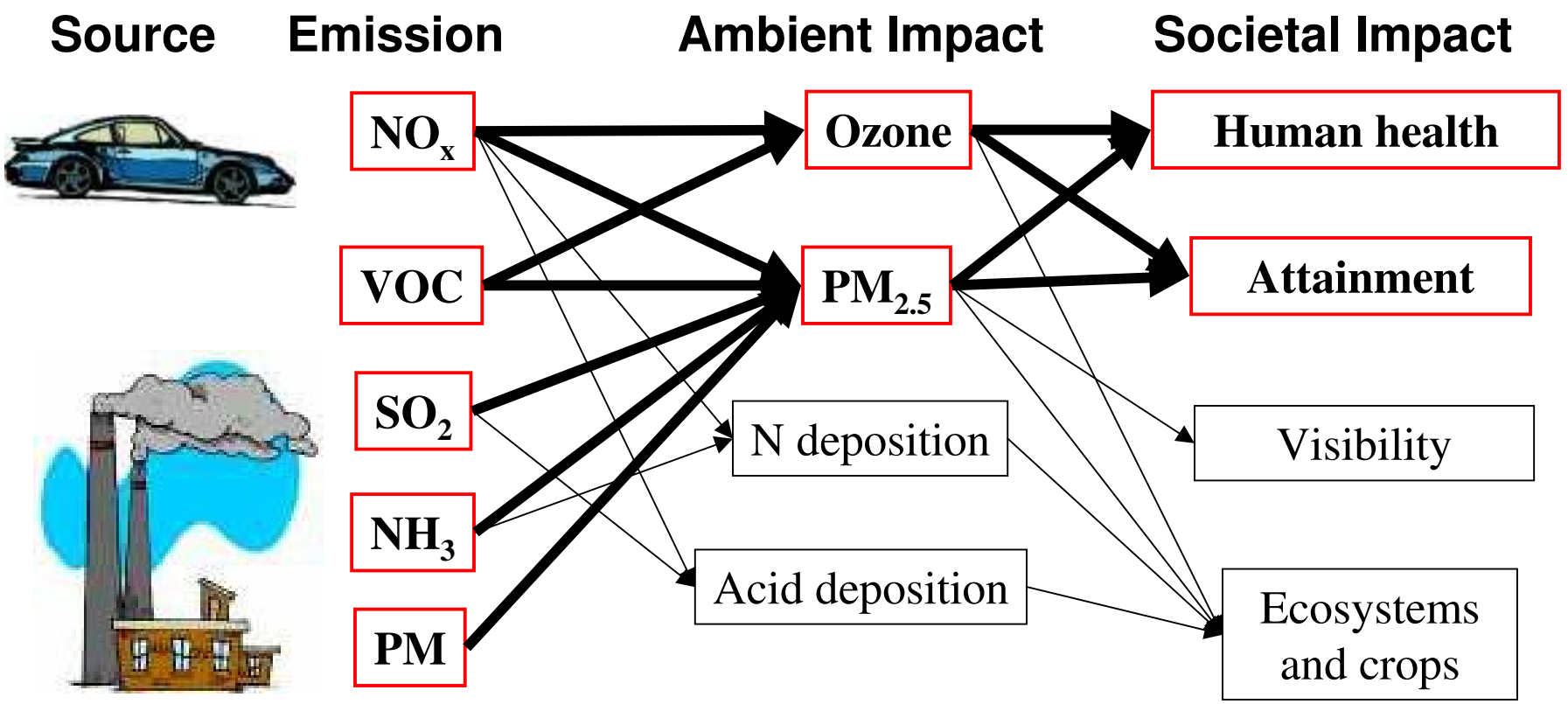
Motivation: Multi-pollutant Attainment

How can we objectively evaluate disparate control options, impacting different precursors, sectors, and locations?



Integrated approach to air quality attainment

Policy Development

- Identify menu of control options to be considered
- Consider regulatory and practical implications ***along with costs, benefits, & sensitivities***
- Develop and implement regulations and policies

Individual measures, overall strategy to model

Sensitivity to controls; Impact & attainment (Y/N) of overall strategy

Iterative search for additional measures

Air Quality Modeling

- Meteorology, emissions & photochemistry for base & future
- ***Sensitivity analysis of responses to various controls by location and species***
- Impact (relative reduction factor) of overall strategy

Control measures to be evaluated

Estimated $/ton of each measure

Modeled base & controlled pollutant concentrations

Morbidity/mortality averted, visibility improved, etc. due to control strategy

Cost Assessment

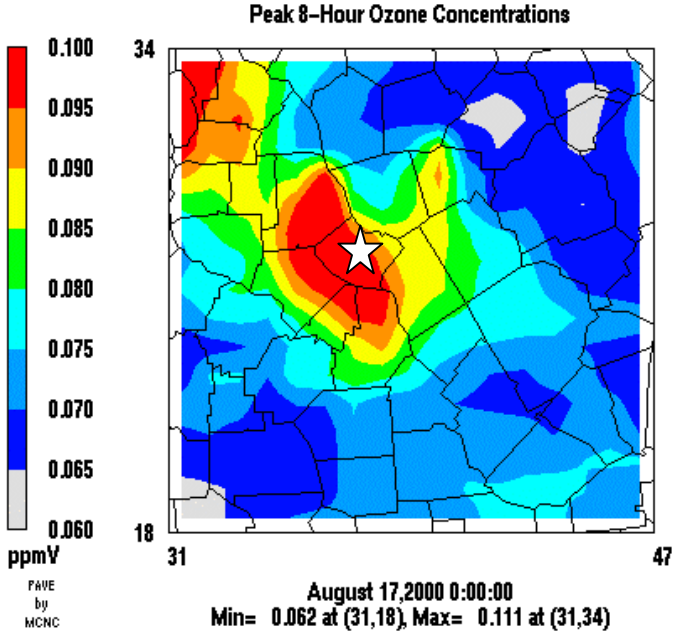
- ***Evaluate cost-effectiveness ($/ton) of each control option***

Benefit Assessment

- ***Evaluate health and other benefits of control strategy***

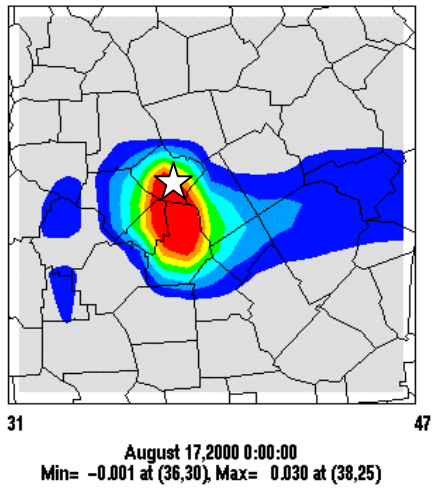
Sensitivity Analysis

Ozone near Macon



Source contribution from...

Macon



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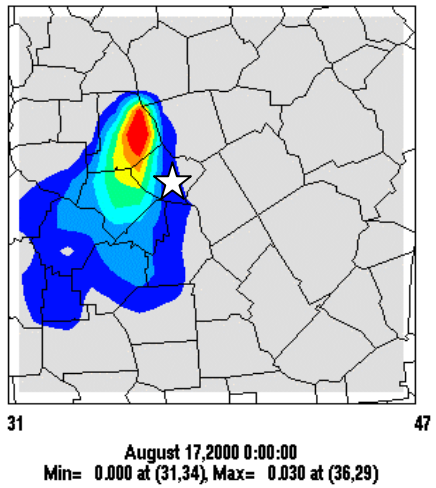
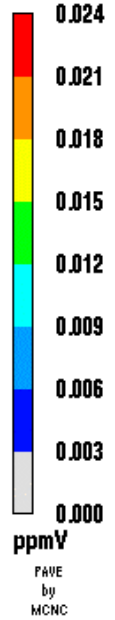
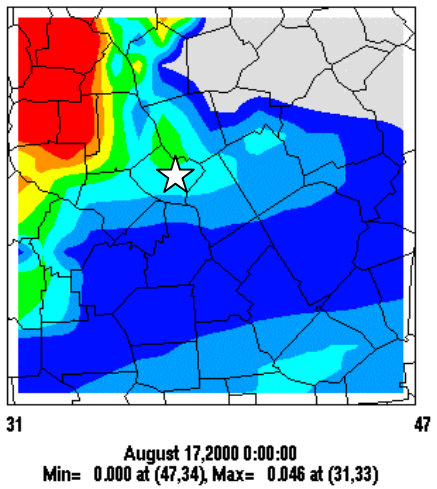
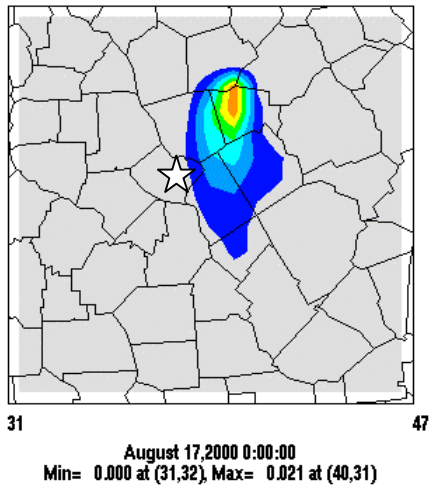




Atlanta



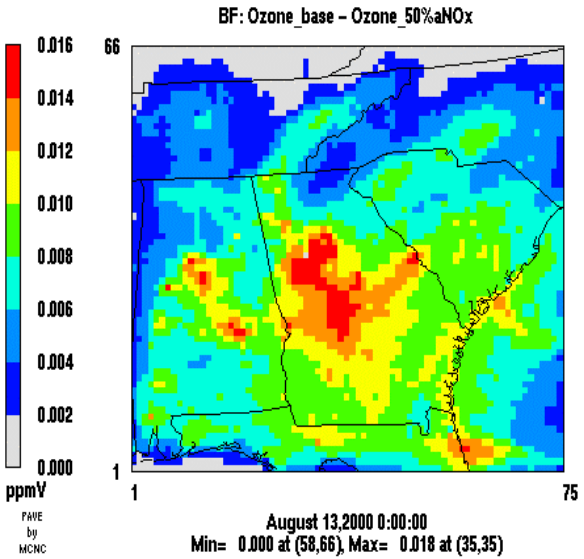
Branch



Fall-line Air Quality Study:
8/17/2000 w/2007 emis.

Benefits analysis with BenMAP

Modeled (or measured) reductions in pollutant levels



U.S. Version BenMAP Environmental Benefits Mapping and Analysis Program

(and other benefits analysis software)

Reduced morbidity, mortality, health costs

Selecting attainment measures

Shared cost-effectiveness metrics facilitate comparisons:

- Attainment at monitor(s)
  - \$/ppb for ozone; \$/($\mu g/m^3$) for $PM_{2.5}$
- Protecting human health
  - Integrated across population and various health outcomes (monetized or non-monetized); e.g., \$/asthma-attack-averted
  - Valuable for strategy selection and for explaining benefits of control efforts

Cost-effectiveness is a necessary but not sufficient consideration for a sensible strategy.

- Political & legal realities and constraints
- Practical considerations
- Equity issues

Challenges to claiming SIP credits for energy efficiency

Emission reduction measures in SIPs must be:

- ✓ **Quantifiable:** How to quantify EE-emissions reduction link?
  - ✓ Very difficult under cap-and-trade (CAIR)
  - ✓ Can retire allowances, or demonstrate that emissions will decrease in the area despite trading
- ✓ **Surplus:** Are the reductions beyond baseline assumptions?
- ✓ **Enforceable:** Under EPA's Voluntary Measures Policy
  - ✓ Credit limited to 6% of total reductions
  - ✓ State responsible for assuring reductions occur
  - ✓ If not, shortfalls must be remedied
- ✓ **Permanent:** Reductions must be ongoing

(See *U.S. EPA (2004), Guidance on SIP Credits for Emission Reductions from Electric-Sector Energy Efficiency and Renewable Energy Measures*)

Promoting Efficiency & Renewables with CAIR & CAMR SIPs

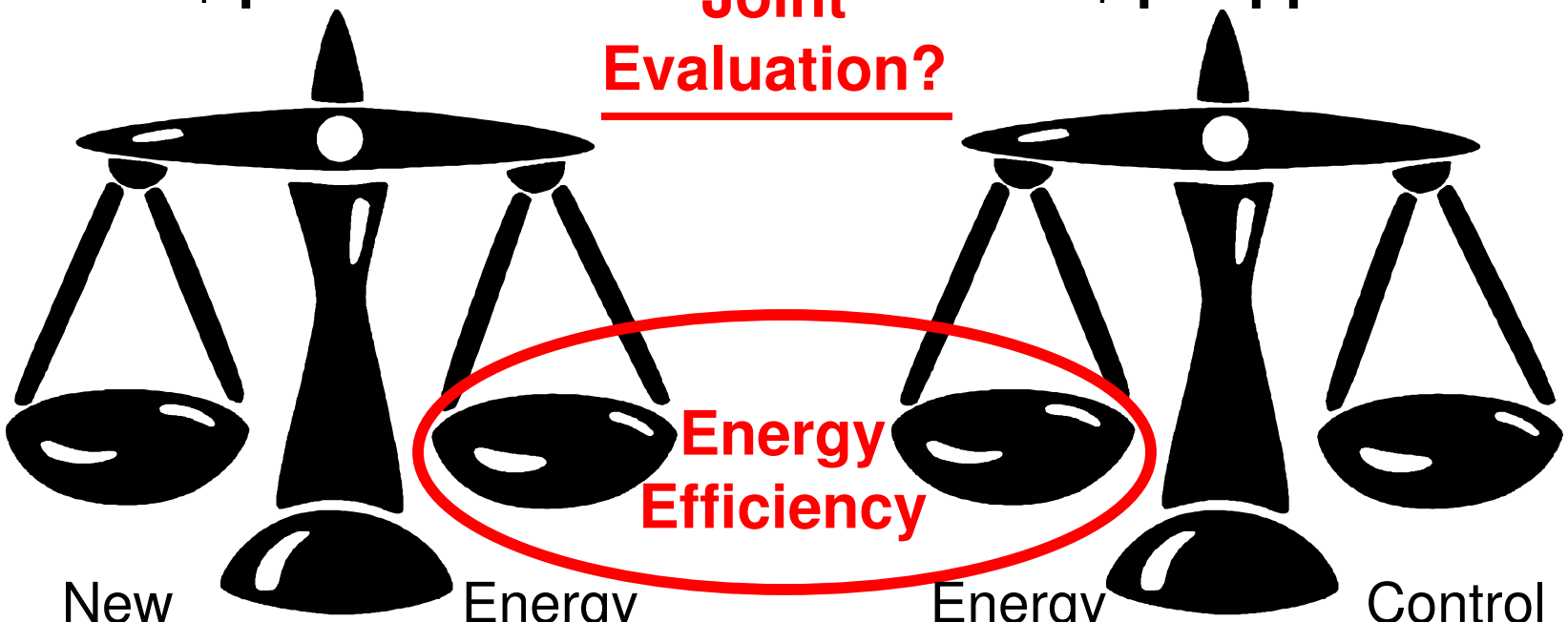
- The Clean Air Interstate Rule and Clean Air Mercury Rule target power plant emissions of NO_x, SO_2, and Hg
- States must develop implementation plans by Fall 2006
  - Variety of opportunities for flexibility
  - Important implications for NAAQS attainment planning
- Three approaches to promote Renewable Energy and certified Energy Efficiency in CAIR/CAMR plans:
  1. Auction part of NO_x and/or Hg credits to generate $
  2. Create a set-aside for RE/EE
     - Financial incentive?
     - Retire for AQ benefit?
  3. Make RE/EE eligible for allocations as new sources

Weighing energy efficiency against alternative options

Public Service Commission: $ per MWh

Air Protection Agency: $ per ppb

Joint Evaluation?



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